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IS 9000-7-6 (1988): Basic environmental testing procedures for electronic and electrical items, Part 7: Impact test, Section 6: Test Ee: Bounce [LITD 1: Environmental Testing Procedure]



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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

**BASIC ENVIRONMENTAL TESTING
PROCEDURES FOR ELECTRONIC AND
ELECTRICAL ITEMS**

PART 7 IMPACT TEST

Section 6 Test Ee : Bounce

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Indian Standard

BASIC ENVIRONMENTAL TESTING PROCEDURES FOR ELECTRONIC AND ELECTRICAL ITEMS

PART 7 IMPACT TEST

Section 6 Test Ee : Bounce

0. FOREWORD

0.1 This Indian Standard (Part 7/Sec 6) was adopted by the Bureau of Indian Standards on 22 June 1988, after the draft finalized by the Environmental Testing Procedures Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 The differences in environmental testing procedures for component type items and equipment type items are fast disappearing in the context of technological developments. It is, therefore, found necessary to have uniform testing procedures, wherever possible. This series of standards on environmental testing procedures (IS : 9000) has been prepared with this objective. This is also in line with the principle adopted by IEC/TC 50 Environmental Testing in developing unified series of standards on environmental testing procedures by International Electrotechnical Commission.

0.2.1 It is proposed to withdraw IS : 589-1961* and IS : 2106† series dealing with environmental tests for electronic components and equipment, respectively, as soon as the tests mentioned therein are covered in the new series of IS : 9000.

0.3 This standard (Part 7/Sec 6) covers procedures for bounce test. Sections 1 to 5 of this

standard have covered the following impact test procedures:

- a) Shock test;
- b) Bump test;
- c) Drop and topple test;
- d) Free fall test; and
- e) Free fall, repeated test.

0.4 This standard (Part 7/Sec 6) has to be read in conjunction with IS : 9001 (Part 1)-1988*. The guidance details are covered in IS : 9001 (Part 17/Sec 5)†.

0.5 While preparing this standard, assistance has been derived from IEC Pub 68-2-55 (1987) 'Basic environmental testing procedures, Part 2 Tests, Test Ee and guidance : Bounce', issued by the International Electrotechnical Commission.

0.6 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960‡.

*Basic climatic and mechanical durability tests for components for electronic and electrical equipment (revised).

†Environmental tests for electronic and electrical equipment.

*Basic environmental testing procedures for electronic and electrical items: Part 1 General.

†Guidance for environmental testing: Part 17 Impact test, Section 5 Bounce.

‡Rules for rounding off numerical values (revised).

1. SCOPE

1.1 This standard (Part 7/Sec 6) covers the procedure for application of bounce test on electronic and electrical items as part of basic environmental testing procedures.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definition and explanation of terms given in IS : 9000 (Part 1)-1977* shall apply in addition to 2.2.

*Basic environmental testing procedures for electrical items: Part 1 General.

2.2 Standard Acceleration (g_n) — Standard acceleration due to the earth's gravity, which itself varies with altitude and geographical latitude.

NOTE — For the purposes of this standard, the value of g_n is rounded up to the nearest unit, that is, 10 m/s².

3. OBJECT

3.1 The object of this test is to produce effects in the item similar to those resulting from irregular and repetitive shocks liable to be encountered by equipment and components during transportation on the load carrying platform of vehicles when the item is either not

fastened to the latter or has some degree of freedom so that it can bounce and scuff or collide with other items of cargo or the sides of the vehicles.

3.2 Selection of Test Severities — Wherever possible, the test severity applied to the items shall be related to the operational environment to which the item will be subjected during transportation.

The specification writer intending to call up this test should refer to IS : 9001 (Part 17/Sec 5)-1988* or further guidance on the selection of test severities relative to typical applications and to 9 to ensure that all such information is included in the relevant specifications.

4. GENERAL

4.1 The test is primarily applicable to items prepared as for transportation and where appropriate in their transport case or frame in which case the latter may be considered as part of the item itself [*see also* 9.2 of IS : 9001 (Part 17/Sec 5)-1988*].

4.2 The relevant specification shall prescribe the acceptable limit(s) on performance observed during final measurements following the bounce test. Normally for this test, it is sufficient that an item should survive the conditions of bounce.

5. TEST EQUIPMENT AND MEASURING SYSTEM

5.1 Characteristics of the Bounce Tester

- a) The bounce tester shall consist of a horizontal platform coupled to shaft-driven accentrics.
- b) The platform shall be of 25 ± 1 mm plywood firmly secured to a steel frame with appropriate barriers (*see* 5.2).
- c) The accentrics shall produce a maximum peak-to-peak vertical displacement of the upper surface of the platform, measured in the region between the drive shafts of 25.5 ± 0.5 mm.
- d) The bounce tester when loaded with the item and any other necessary devices for the conditioning, shall also have the characteristics specified in the appropriate test method (*see* 5.6).

5.2 Horizontal Motion — The horizontal motion of the item shall be limited by suitable wooden barriers to that required by the appropriate test method (*see* 5.6). These barriers shall simulate the resilient properties of pinewood board, 50 mm in thickness.

* Guidance for environmental testing: Part 17 Impact test, Section 5 Bounce.

For both methods, the top edge of the barrier shall be not more than 600 mm above the platform and shall comply with the following additional requirements:

- a) *Method A* — It shall be at least at the height of the specimen; and
- b) *Method B* — It shall be between 25 and 75 mm below the top of the specimen.

A suitable barrier arrangement is described in 4 of IS : 9001 (Part 17/Sec 5)-1988*.

5.3 Mounting — For the purpose of this test the item is never fastened or otherwise fixed to the bounce tester during conditioning.

5.4 Control — The acceleration of the platform is determined by the shaft speed. The acceleration of the item need not be measured.

5.5 Horizontal Accuracy of Platform — The bounce tester shall be installed so that, with the accentrics at the lowest point, the platform is horizontal within the following tolerances including an allowance for play in the drive mechanism:

- a) *Method A* : $\pm 0.5^\circ$ in the longitudinal and lateral axes; and
- b) *Method B* : Between $10'$ and 0.5° in the longitudinal axis and $\pm 0.5^\circ$ in the lateral axis.

5.6 Test Methods

5.6.1 Method A : Synchronous Circular Motion

5.6.1.1 The motion of the platform of the bounce tester shall be such that each point of this platform describes a circle in the vertical plane with a diameter of 25.5 ± 0.5 mm.

5.6.1.2 The peak acceleration of the platform shall be between 1.1 and 1.2 g . This can be attained by a mean shaft speed of 285 ± 3 rev/min.

5.6.1.3 The item prepared as for transportation with or without its transport case as prescribed by the relevant specification, shall be placed without being attached on the platform centrally between the drive shafts.

5.6.1.4 The horizontal motion allowed by the barriers shall be adjusted to a total of 50 ± 5 mm, that is, the item when placed at the centre of the platform in its normal position shall have a free movement in any horizontal direction of a nominal 25 mm (*see* 5.2).

5.6.2 Method B : Non-Synchronous Motion

5.6.2.1 The motion of the platform shall vary cyclically between a linear vertical and on

* Guidance for environmental testing: Part 17 Impact test, Section 5 Bounce.

oscillatory motion. This motion shall be produced by a nominally vertical drive applied to the platform along two transverse lines spaced not less than 600 mm nor more than 1 700 mm apart. The applied peak-to-peak value of the displacement at the drive points on the platform shall be 25.5 ± 0.5 mm.

5.6.2.2 The frequencies at the two drive points shall be related in the ratio 1 to 0.9 with a tolerance of ± 0.03 ; the higher speed shaft shall rotate at a mean speed of 285 ± 5 rev/min. A mechanism for producing the required motion is referred to in 5 of IS : 9001 (Part 17/Sec 5)-1988*.

5.6.2.3 In the direction transverse to the required motion, the displacement shall be in principle zero except for the effects of play in the drive mechanism.

5.6.2.4 The distance between the drive points on the platform shall normally be greater than the longest base dimension of the item undergoing test and the size of the test facility shall be chosen accordingly.

NOTE — When there is no facility fully satisfying the requirements, the available facility may be used provided that this is stated in the test report.

5.6.2.5 The item prepared as for transportation with or without its transport case as prescribed by the relevant specification, shall be placed, without being attached, on the platform centrally between the drive points.

5.6.2.6 The horizontal motion allowed by the barriers shall be adjusted to a total between 100 and 150 mm, that is, the specimen when placed at the centre of the platform its normal position shall have a free movement in any horizontal direction between 50 and 75 mm (see 5.2).

6. SEVERITY

6.1 The duration of conditioning shall be selected from the severities given below. These severities represent the nominal duration of conditioning, exclusive of recovery periods, to be applied:

180 min
60 min
15 min
5 min

6.1.1 The duration of conditioning shall be divided equally between the specified attitudes [see 6.2 of IS : 9001 (Part 17/Sec 5)-1988*]

7. PRE-CONDITIONING

7.1 The relevant specification may call for pre-conditioning.

*Guidance for environmental testing: Part 17 Impact test, Section 5 Bounce.

8. INITIAL MEASUREMENTS

8.1 The item shall be submitted to the visual, dimensional and functional checks prescribed by the relevant specification.

9. CONDITIONING

9.1 Where the aspect ratio of the item (the ratio of the longest side to its shortest) does not exceed 3 : 1 and the mass does not exceed 50 kg, the item shall be subjected to bounce on each of its faces (for example, 3 faces for a cylinder and 6 for a rectangular object). When placed on each face, it shall be subjected to bounce twice, being turned through 90° in the horizontal plane between the two bounces so that the impact with the barriers of the bounce tester occurs along two perpendicular axes. If there is a long side to the face, one axis of impact with the barriers shall be parallel to this.

9.2 For items of greater aspect ratio or mass or of a different form the test shall be carried out as required by the relevant specification [see 7 of IS : 9001 (Part 17/Sec 5)-1988*].

9.3 Where there is only a limited number of faces on which the item would be transported, the relevant specification shall state the attitude(s) of the item for the test [see 7 of IS : 9001 (Part 17/Sec 5)-1988*].

9.4 If required by the relevant specification, items of any aspect ratio may be stacked, provided that the overall height does not exceed 600 mm. The relevant specification shall state what special rearrangements, if any, are needed to constrain the topmost specimen.

NOTE — Excessive temperature rises may occur in items which contain highly resilient structures or parts, except possibly for the severity of 5 min. In such cases, it may be necessary, in order to prevent an excessive temperatures rise within the specimen, to carry out the test in a series of phases (each of, say, 5 min bouncing followed by a recovery period of 5 min or longer) as required by a relevant specification.

10. FINAL MEASUREMENTS

10.1 The item shall be submitted to the visual, dimensional and functional checks prescribed by the relevant specification.

The relevant specification shall provide the criteria upon which the acceptance or rejection of the item is to be based.

11. INFORMATION TO BE GIVEN IN THE RELEVANT SPECIFICATION

11.1 When this test is included in a relevant specification, the following details shall be given

*Guidance for environmental testing: Part 17 Impact test, Section 5 Bounce.

IS : 9000 (Part 7/Sec 6) - 1988

as far as they are applicable:

| | <i>Clause</i> | | <i>Clause</i> |
|---|---------------|---|---------------|
| a) Acceptance and rejection criteria [see 9 of IS : 9001 (Part 17/Sec 5)-1988*] | 4.2 | f) Pre-conditioning | 7 |
| b) Test method/motion of the platform [see 5 of IS : 9001 (Part 17/Sec 5)-1988*] | 5.6 | g) Initial measurements [see 9 of IS : 9001 (Part 17/Sec 5)-1988*] | 8 |
| c) Testing with or without transport case | 5.6 | h) Attitude and orientation of specimen [see 7 of IS : 9001 (Part 17/Sec 5)-1988*] | 9 |
| d) Size of test facility | 5.6.2 | j) Stacking requirements [see 8 of IS : 9001 (Part 17/Sec 5)-1988*] | 9 |
| e) Severity [see 6 of IS : 9001 (Part 17/Sec 5)-1988*] | 6 | k) Final measurements [see 9 of IS : 9001 (Part 17/Sec 5)-1988*] | 10 |

*Guidance for environmental testing: Part 17 Impact test, Section 5 Bounce.

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